TriQuint

TQP4M0011

Low Loss SP3T Reflective Switch

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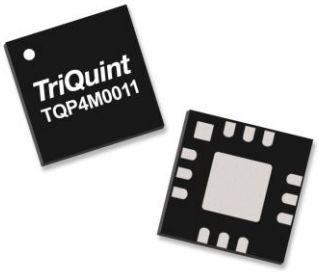
Applications

- WLAN
- Cellular Infrastructure
- Test and Measurement
- Smart Energy
- UHF/VHF
- LMR
- General Purpose Broadband Wireless

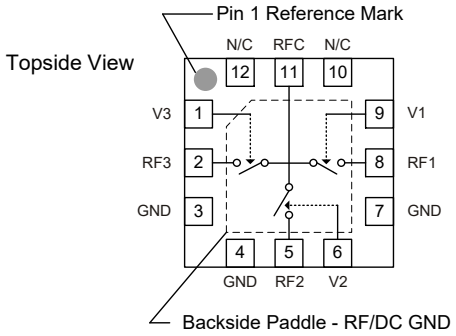


12-pin 3x3 mm QFN Package

Product Features

- General Purpose
- Broadband: 100-6000 MHz
- Low Insertion Loss: 0.6 dB at 2 GHz
- High Input IP3: +55 dBm at 2 GHz
- CMOS Compatible Triple Voltage Control
- Lead Free, RoHS Compliant QFN Package

Functional Block Diagram



General Description

The TQP4M0011 is GaAs FET single-pole, three throw (SP3T) switch with control signals from three independent control bias lines. Signal path (switch) states may be controlled using DC voltages operating from 1.8 to 5 Volts. The TQP4M0011 has 100 to 6000 MHz broadband performance

The TQP4M0011 is packaged in a RoHS-compliant, compact 12-pin 3x3 mm QFN package.

The TQP4M0011 is an ideal choice for wireless infrastructure and test & measurement applications requiring low insertion loss and high input IP3. It can also be used for any general purpose RF application where isolation is critical.

Pin Configuration

Pin No.	Symbol
1	V3
2	RF3
3, 4, 7	GND
5	RF2
6	V2
8	RF1
9	V1
10, 12	N/C
11	RFC
Backside Paddle	RF/DC GND

Ordering Information

Part No.	Description
TQP4M0011	SP3T Reflective Switch
TQP4M0011-PCB	0.1- 6.0 GHz Evaluation Board

Standard T/R size = 2500 pieces on a 7” reel

Absolute Maximum Ratings

Parameter	Rating
Storage Temperature	-65 to 150°C
RF Input Power, CW, 50Ω, T = 25°C	+33 dBm
Control Voltage (V1/V2/V3)	+6 V

Operation of this device outside the parameter ranges given above may cause permanent damage.

Recommended Operating Conditions

Parameter	Min	Typ	Max	Units
V1/V2/V3 High State	1.8	3.3	5.0	V
Operating Temp. Range	-40		+85	°C

Electrical specifications are measured at specified test conditions. Specifications are not guaranteed over all recommended operating conditions.

Electrical Specifications

Test conditions unless otherwise noted: Temp.=+25°C, 50 Ω system

Parameter	Conditions	Min	Typ	Max	Units
Operational Frequency Range		100		6000	MHz
Control Voltage	Low	0		0.4	V
	High	1.8	3.3	5.0	V
Insertion Loss	0.1 – 1.0 GHz 1.0 – 2.5 GHz 2.5 – 3.0 GHz 3.0 – 4.5 GHz 4.5 – 6.0 GHz		0.4 0.6 0.8 1.2 1.5		dB
Isolation	0.1 – 1.0 GHz 1.0 – 2.5 GHz 2.5 – 3.0 GHz 3.0 – 4.5 GHz 4.5 – 6.0 GHz		36 34 33 31 30		dB
Return Loss – RFC Port	0.1 – 1.0 GHz 1.0 – 2.5 GHz 2.5 – 3.0 GHz 3.0 – 4.5 GHz 4.5 – 6.0 GHz		29 19 16 12 10		dB
Input P1dB	*f* = 2 GHz		+34		dBm
Input IP3	*f* = 2 GHz , Pout=+15 dBm/tone, Δf=1 MHz	+50	+55		dBm
Switching Speed	t_{ON},t_{OFF} (50% CTL to 10/90% RF)		110		ns
Control Voltage Bias Current	V1 or V2 or V3=5 V			15	uA

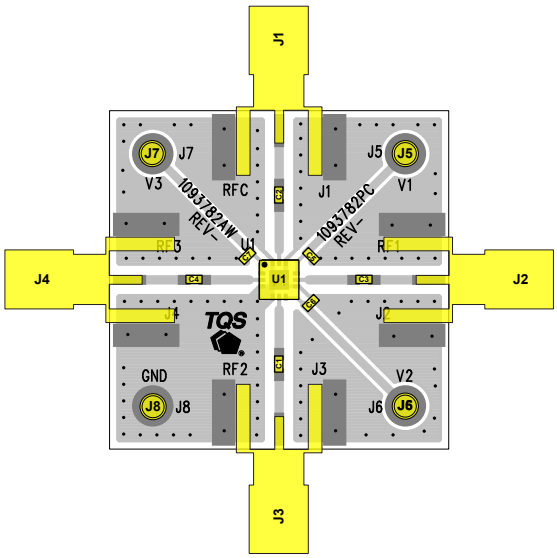
Digital Control Voltages

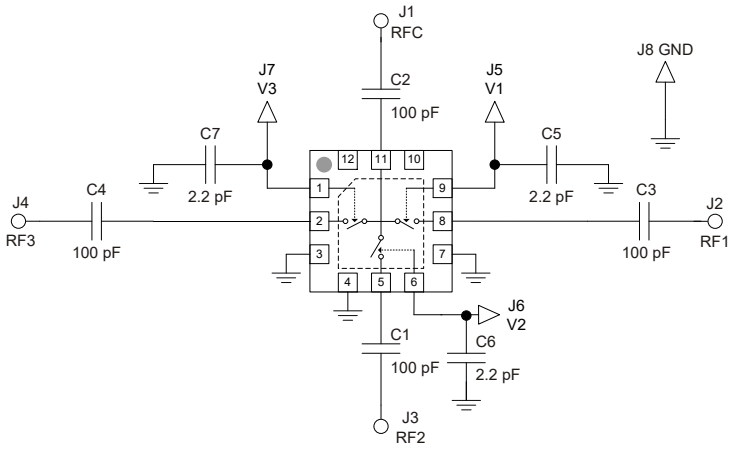
State	Bias Condition
Low	≤ 0.4 V
High	≥ 1.8 V

Switch Control Truth Table

Control Voltages			Signal Path State		
V1	V1	V3	RFC to RF1	RFC to RF2	RFC to RF3
Low	Low	High	Off (isolation)	Off (isolation)	On (insertion loss)
Low	High	Low	Off (isolation)	On (insertion loss)	Off (isolation)
High	Low	Low	On (insertion loss)	Off (isolation)	Off (isolation)
All Other States			N/A	N/A	N/A

Reference Design (TQP4M0011-PCB)





Notes:
1. See Evaluation Board PCB Specifications section for material and stackup.

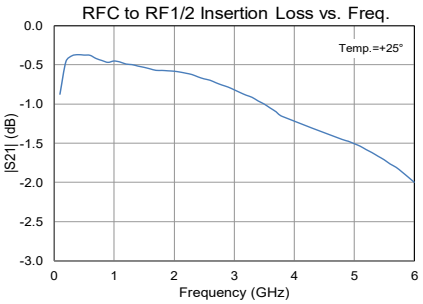
Typical Performance - (TQP4M0011-PCB)

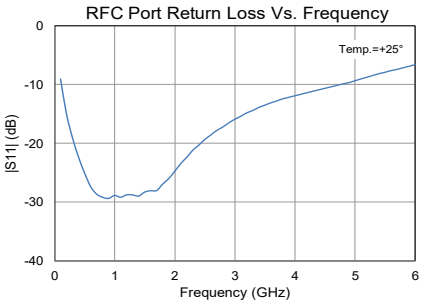
Test conditions unless otherwise noted: Temp=25°C, 50 Ω system

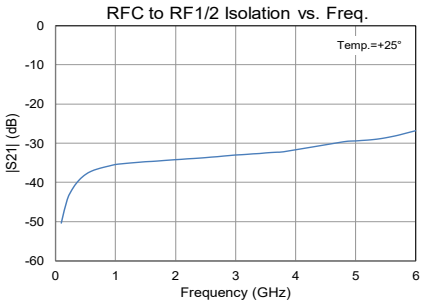
Parameter	Conditions	Typical Value			Units
Frequency		1	2	3	GHz
Insertion Loss	RFC Port to RF1 or RF2 or RF3	0.5	0.6	0.8	dB
RFC Port Return Loss		29	25	16	dB
Isolation	RFC Port to RF1 or RF2 or RF3	36	35	33	dB
Input P1dB		+34	+34	+33.5	dBm
Input IP3	Pout= +15 dBm/tone, Δf=1 MHz	+53	+55	+56	dBm

Performance Plots - (TQP4M0011-PCB)

Test conditions unless otherwise noted: Temp=+25°C, 50 Ω system

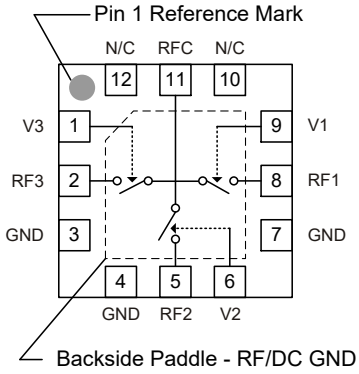






Pin Configuration and Description

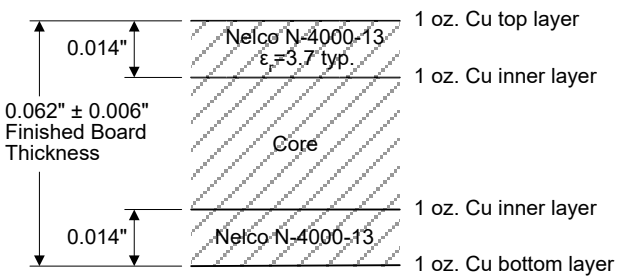
Topside View



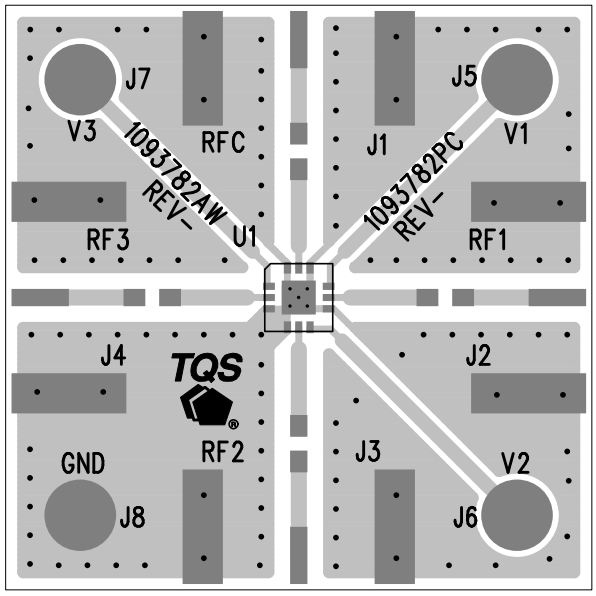
Pin No.	Symbol	Description
1	V3	Switch state control voltage
2	RF3	RF Input/Output port 3
3, 4, 7	GND	Ground
5	RF2	RF Input/Output port 2
6	V2	Switch state control voltage
8	RF1	RF Input/Output port 1
9	V1	Switch state control voltage
10, 12	N/C	No electrical connection. Provide grounded land pads for PCB mounting integrity.
11	RFC	Antenna port
Backside Paddle	RF/DC GND	RF/DC Ground. Use recommended via pattern and ensure good solder attach for best thermal and electrical performance.

Evaluation Board PCB Specifications

PCB 1093782 Material and Stack-Up



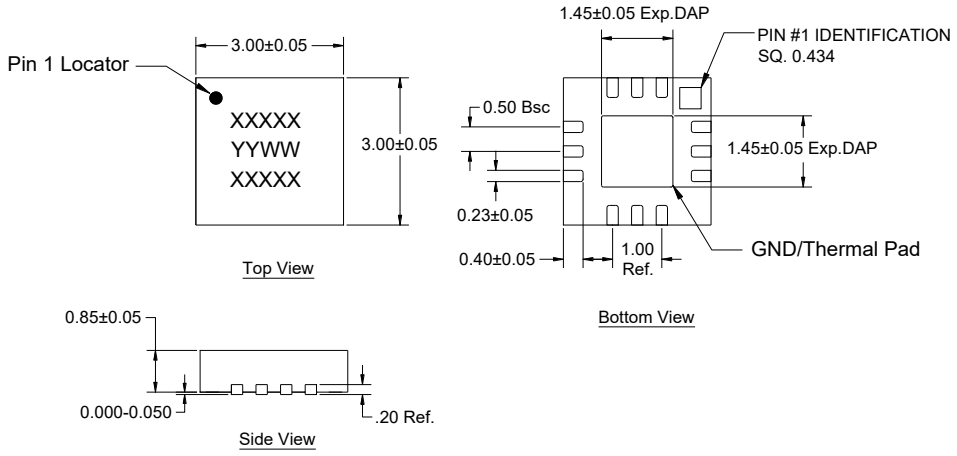
50 ohm line dimensions: width = .028”, spacing = .028”



Mechanical Information

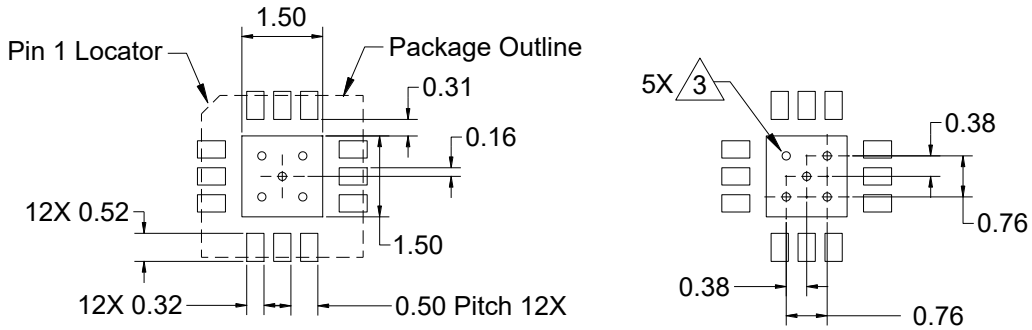
Package Marking and Dimensions

Marking: Product Code – XXXXX
Year/Week - YYWW
Assembly Code - XXXXX



Notes:
1. All dimensions are in millimeters . Angles are in degrees.
2. Dimension and tolerance formats conform to ASME Y14.4M-1994.
3. The terminal #1 identifier and terminal numbering conform to JESD 95-1 SPP-012.

PCB Mounting Pattern



COMPONENT SIDE

Notes:
1. All dimensions are in millimeters. Angles are in degrees.
2. Use 1 oz. copper minimum for top and bottom layer metal.
3. Drill via holes as required for a final plated thru diameter of 0.152 mm (0.006”).
4. Ensure good package backside paddle solder attach for reliable operation and best electrical performance.

Product Compliance Information

ESD Sensitivity Ratings

Caution! ESD-Sensitive Device

ESD Rating: Class 1B (RF Ports)
Value: 500 volts to < 1,000 volts
Test: Human Body Model (HBM)
Standard: ESDA/JEDEC Standard JS-001-2012

ESD Rating: Class 1A (DC Lines)
Value: 250 volts to < 500 volts
Test: Human Body Model (HBM)
Standard: ESDA/JEDEC Standard JS-001-2012

ESD Rating: Class C3
Value: ≥ 1000 volts
Test: Charged Device Model (CDM)
Standard: ESDA/JEDEC Standard JS-002-2014

MSL Rating

MSL Rating: Level 1

Solderability

Compatible with both lead-free (260°C max. reflow temperature) and tin/lead (245°C max. reflow temperature) soldering processes.

Package contact plating: NiPdAu

RoHs Compliance

This part is compliant with EU 2002/95/EC RoHS directive (Restrictions on the Use of Certain Hazardous Substances in Electrical and Electronic Equipment).

This product also has the following attributes:

- Lead Free
- Halogen Free (Chlorine, Bromine)
- Antimony Free
- TBBP-A ($C_{15}H_{12}Br_4O_2$) Free
- PFOS Free
- SVHC Free

Important Notice

For the latest specifications, additional product information, worldwide sales and distribution locations, and information about TriQuint:

Web: www.triquint.com **Tel:** +1.503.615.9000
Email: info-sales@triquint.com **Fax:** +1.503.615.8902

For technical questions and application information:

Email: sjcapplications.engineering@triquint.com

Contact Information